OLD AGE DEFERRED

BERNARD HOLLANDER, M.D.

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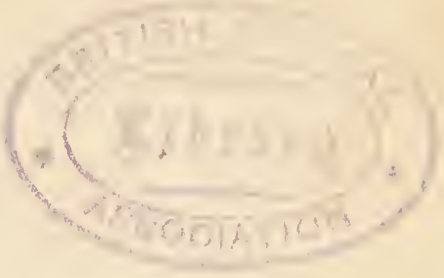

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THE *PREVENTION* OF
THE DISABILITIES AND DISEASES OF OLD AGE

BY

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by measures which increase the constitutional vigour, we can increase the natural defence reactions and recuperative powers of the body, so as to preserve health and make life enjoyable to the very end.

It is admitted that the vital processes are largely of an electrical or electro-chemical nature, and that the infirmities of old age are due to a diminution in the vital energy, chiefly owing to the decay of certain glands—the ductless glands, and especially the sex glands. This accounts for the present popularity of making up the deficiency of their secretions with preparations of glandular extracts; and hence, also, the well-known attempts of Steinach and Voronoff to revive the activity of these glands by surgical operation.

It will be shown, however, that a simpler and safer method of increasing the vital energy is by the administration of radium emanation, which is contained in many natural rejuvenating springs and can also be artificially prepared; for radium emanation has a high electrical conductivity and a specific action on the glands of internal secretion. It, undoubtedly, wards off the bodily and mental disabilities of senility and increases

the general well-being. The author has studied the subject very closely for more than twenty years and has applied radium emanation treatment with extraordinary success.

The publication of this volume is intended to stimulate further research in this direction, and to give the method employed—the efficacy of which is already acknowledged by many eminent authorities—a wider application and a larger sphere of usefulness.

BERNARD HOLLANDER, M.D.

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CHAPTER I

WHAT IS OLD AGE?

The attainment of a healthy old age is probably the secret desire of everyone; but only a few are privileged to achieve it. Unfortunately we know of no process to prolong life; nor is "rejuvenation," in the sense of a return to a condition identical with that of earlier years, possible. But we can reactivate the bodily processes, so as to prolong health and, with it, the active period, and can prevent or reduce premature signs of senility. Unless old age can be accompanied by the retention of sound mental faculties and bodily functions that render life pleasant, it is not worth longing for.

With increasing years—generally after sixty-five—there is a gradual diminution in vital energy, and a slowing of the various functions of the body, and, consequently, a greater susceptibility to disease. We are constantly moving from one period of life to

another, and, if we live long enough, are bound to show signs of senescence; but that miserable condition we call "senility" is not a law of nature. We shall show in this book that, with care and skill, the chances of a healthy old age can be increased, and that period of life made as comfortable and happy as any other stage of our existence.

What is old age? Old age is certainly not a question of years alone; for some men seem not to grow old at all, in the ordinary sense of the term; whilst others are already old between fifty and sixty. It may be said that this is due to the sort of life they have led; but in many cases there is no such reason that will bear investigation. We shall be better able to answer the question if we examine what takes place when we are growing old.

In all forms of life there are two bodily processes of outstanding importance continually taking place, viz. building up (anabolism) and breaking down (katabolism), and, if health is to be kept up to a normal standard, a certain proportion between these two processes must always be maintained; for, if the breaking down continues to occur faster than the building up, the result will

be progressive weakness, terminating eventually in exhaustion and death.

In youth, restoration or new growth takes place rapidly; in old age, the ever-changing cells of the body renew themselves but slowly. There is less resistance, quicker exhaustion, and weaker repair. The clearing out of waste products is retarded, the machine is getting more or less clogged, and will not run smoothly any more. Indeed, Metchnikoff, the celebrated Professor of the Pasteur Institute, believed that old age comes from slow self-poisoning—auto-intoxication—from the body's absorption of impurities, accumulated chiefly in the intestinal canal.

As a matter of fact, senescence (the state of growing old) is a progressive diminution in the vital activity of all the elements of which the body is composed, causing changes in their functions.

Having described what takes place when we are growing old, the next question to answer is, why do some men grow old sooner than others, from no fault of their own? On investigation we shall find that one of the preliminary conditions for a healthy old age, and consequent longevity, is a sound constitution, derived from healthy ancestors.

Indeed, heredity seems to determine, to a large extent, the length of life. Provided that good use is made of it, we ought to reach the same age as our parents, and, with care, should live longer than they did.

W. Schmidt ("Longevity and Heredity"), taking Austrian pre-war statistics, found that of 281 eighty-year-old men 102 came from parents of whom one was over eighty, and 64 from parents both of whom were over eighty. Then, taking Jewish almshouses (Jews being notoriously long-lived), he found that 41 per cent. of the inmates came from parents both of whom were over seventy years old.

To have descended from a long-lived stock seems, therefore, to be the principal factor of longevity; and, next to it, we should place the good fortune to have escaped the greater ills of life. However, as Sir Hermann Weber ("Means for the Prolongation of Life") has pointed out, though the chances of a person belonging to a long-lived family are generally much better than those belonging to ordinary families, it would be dangerous to rely too much on such a privilege.

The tendency to early death seems also hereditary in some families; but it is certain

that by judicious management, if commenced early enough, life can be considerably prolonged in spite of the hereditary tendency to early death. We use the word "heredity," but there is no such fixed law to make sure of the length of life or the liability to definite diseases. All we can say is that there is a certain tendency, and even that tendency might be wiped out, were greater care taken in the mode of living and, especially, in the selection of a matrimonial partner; for it takes two to make a new life, to create a new being. A strong healthy mother has not infrequently saved a family on the point of dying out.

A good many biologists hold that length of life is determined at the time of conception. At conception the future being inherits a definite amount of energy. This energy of the germ plasm is the capital of life. It rests with us how we spend it. Life is limited to a period, during which the living substance of the body has taken up the quantum of energy at its disposal. The involution which takes place in old age is due, primarily, to the gradually weakening energy charge set in action at the moment of fertilisation. Strangely tenacious is this initial life energy.

Decadent this or that part of the body may be, but the mainspring holds still, and often carries on to old age a very weakly flesh. Many a man, who has been an invalid the greater part of his life, has nevertheless lived to an advanced old age. As the bodily hold on life relaxes, with the failure of the energies of the tissues, the mental hold is loosened as well, until, at the approach of death, the desire to live is either diminished or entirely absent.

For a healthy old age there must be an inherent or inborn quality of endurance, of steady persistent nutritive force, which includes reparative force, and resistance to disturbing agencies, and a good proportion or balance between the several organs. If the heart and the digestive system be disproportionately strong, they will overload and oppress the other organs, one of which will soon give way; and, as the strength of the human body, like that of a chain, is to be measured by its weakest link, one disproportionately feeble organ endangers or destroys the whole.

In the sound body the heart, lungs, all organs and all functions—sensory, secretory, excretory, etc.—are united in a common

purpose, to secure a satisfactory adjustment in living. If the lungs do not supplement and facilitate the work of the heart, if the glands of internal secretion do not assist the digestive system to perform its functions, or if the nervous system fails to co-ordinate all the various processes, the resulting disorganisation interferes with the soundness of the body. Any interference with the nervous system is very apt to interfere with the distribution and discharge of energy. But it is also true that any disturbance of the circulatory, respiratory, secretory, and excretory functions may upset the orderly production and effective utilisation of energy.

Further, there must be freedom from organic disease of the important organs, and, consequently, freedom from exposure to the various casualties, indiscretions, and other causes of disease to which illness and early death are so much due. Whilst we are well, we want to live as long as possible. Yet many people systematically shorten their existence, and make it unbearable, owing to the diseases they contract, almost universally by their own fault. The loss of our powers is caused, frequently, far more by the carelessness and vices of youth than by the ravages

of time. Intemperate and licentious habits of early years leave us in old age with a worn-out body.

In addition, freedom from anxiety is essential. The absence of wear and tear of mind is probably one reason why most centenarians are found in the country, usually among the poor and ignorant classes. They have not worried, because they have taken things as they came with the fatalistic resignation of the poor in spirit. The intellectual and other problems, which press so hard on this generation, leave them untouched. With them, sufficient for the day are the needs thereof.

CHAPTER II

PHYSICAL SIGNS OF SENILITY

NATURE is kind to the majority of ageing men, and imperceptibly prepares the system for the change, so that they pass through it with comparatively little trouble. It is commonly assumed that sixty-five is the age when actual senescence begins. After that age, insurances against sickness and accidents are no longer accepted by the Insurance Companies, except by special arrangement and on special terms; and, in most Government and other public departments, sixty-five is the compulsory retiring age. Yet a person seventy years old may still be very active, physically and mentally, and may have only one or other sign of oncoming old age, which he may not even perceive himself.

We shall the more easily realise that the infirmities and maladies of old age are not essential to it if we look at them singly; for

then it will become apparent that there is scarcely one of them that is invariably present in old age, anyhow not to an alarming extent.

The most common symptom of old age is the progressive loss of the elasticity of the arteries, which is a sign of the general wear of the body and may cause the brain to deteriorate in its functions. The arteries become thicker and harder, and later tortuous and knotted, as may be seen in the temporal arteries, visible beneath the skin, which may stand out prominently. The consequences are that the supply of blood to the brain and the various parts of the body is no longer kept up at a continuous rate and pressure. Such lessening of the nutrition of the brain may show itself in loss of memory, and, if very severe, in enfeeblement of the intellect, and other signs of mental failure. The chief danger is that of apoplexy, owing to the rupture of the brittle and degenerate blood-vessels of the brain; but this generally occurs in men who have not adapted their activities to their age, and are given to mental, emotional, and physical excesses, over-eating and other indulgences, which a wise man would avoid altogether, or attempt only with due caution.

The gradual thickening of the arteries rarely has any marked result, unless arising from or accompanying heart disease, or chronic kidney disease, or due to infections or intoxications; and should then be attended to by a physician.

With the hardening of the arteries the blood pressure rises, and it is this, actually, which alarms the old person when told of it. The blood pressure is taken by the physician for his own guidance, and often it would be wiser not to tell the patient, who is apt to attach greater importance to it than is warranted; for, if the rise has come about gradually, and is not excessive, there is nothing alarming in it. Often the pressure varies from day to day, according to the emotional condition or state of fatigue of the patient, and whether he indulges in muscular strain, or excess of food or drink. The less the old man knows about it, the better. A wise physician will counsel precautions without exciting fear.

Owing to the general diminution of energy affecting also the muscles, in very advanced old age the shoulders may grow somewhat rounder, the step get less elastic and finally shuffling, and stooping may become irksome;

but, nevertheless, there are plenty of old men of an erect and martial carriage. There may also be muscular inco-ordination, and tremors of the hand are not uncommon; but they may also occur in younger men. Owing to partial absorption of the cartilages between the spinal vertebræ, a slight lessening of the height may take place; and, from stiffness of the joints, there may be a loss of stretching power. The bones grow lighter and more brittle, and fractures are not uncommon, but the broken bones may still unite readily enough if the person is healthy; only in the case of the neck of the hip-bone there may be a difficulty. Deposits in the joints may occur, from imperfect tissue change causing excess of uric acid. When the joint becomes painful it is not used, and then the muscles get stiff as well from disuse. Quite frequently this is due to lack of care in food or drink, or both, and therefore can be prevented.

The body may get thin, the tissues atrophy, and the skin become dry and wrinkled, and the bony prominences more marked; but frequently the roundness of youth is preserved, and the skin continues smooth and soft. The teeth may fall out; but, again, in

some men they remain perfectly sound in their sockets. Sight and hearing frequently become impaired; but, on the other hand, venerable men and women often retain the acuteness of their senses. The edge of the cornea of the eye may degenerate and form an opaque ring; and a similar kind of change may take place, in some people, in the lens of the eye, producing cataract; but still, only in isolated cases.

More common is a shortness of breath, with a slight asthmatic tendency; and, owing to the poorer circulation of the blood, the body temperature may become subnormal, and the senile individual may complain of cold, and get easily chilled. This causes the old to be very dependent upon weather, climate, and seasons. Winter is the hardest upon them. A large number die from the breakdown of the respiratory system, which, with care in due time, can be avoided.

Other ailments, peculiar to the aged, such as loss of bladder control, affect only a very limited proportion of them; often being due to causes that were operative long before old age supervened, and which would not have persisted if treated in time.

Women can hide their age better than men. Still, they often become more masculine in appearance, their skin less unctuous, and stray hairs may appear on the face; on the other hand, many of them, at the evening of life, acquire greater loveliness.

One of the chief traits of old age, in men, is the loss of the germ plasm. Consequently, secondary sex qualities fade, and the sexes again become more alike. Yet, there are numerous old men—and women, long after their climacteric changes—who, contrary to expectation, have their sex qualities still preserved. Therefore, taking an all-round view of old age, a diminution in general energy is bound to occur; but each specific sign is avoidable if proper care be taken.

At the close of life the energies become less and less, the movements become less frequent, and less energetic, atrophy begins, and death is the end. "Natural death," viz. the termination of existence due to a uniform senescent atrophy of all the structures of the organism, leading to a simultaneous depression and extinction of all the functions, is probably very rare. In actuality, death is always, in some measure, accidental. Some other misfortune occurs as the result

of a chance encounter. The same encounter, however, may have occurred repeatedly in the life of the individual without his ever having been conscious even of indisposition. The final encounter has a different issue; simply because the underlying senescence of his tissues has rendered them more vulnerable. So, after all, death is, and must be, the end of this general ageing of the tissues.

Death, in the aged, therefore, is a slow process, not a sudden event; a man may begin to die ten or fifteen years before he is buried. As Cicero said: "Whereas the death of young men seems to be like putting out a great fire with a deluge of water, old men die like a fire going out because it has burnt down of its own nature, without artificial means." And as another wise Roman, Seneca, said: "Man does not come upon death all of a sudden; he advances towards it, step by step. Each day we are dying, each day takes away from us a portion of our life, and even our growing is only a decreasing of life. It is not the draining away of the last drop, but of those that went before, which empties a clepsydra [the ancient Roman water-clock]; likewise the day on which we cease to live does not bring about

death, but completes it. We arrive at the end, but we have been on the road for a long time. There is therefore more than one death; that which takes us off is only the last."

CHAPTER III

SENILE MENTAL CHANGES

Long before any physical signs of old age appear, mental changes may have occurred quite imperceptibly. A man, hitherto full of energy, enthusiasm, and cheerfulness, discovers that the pleasures of life no longer offer the same enjoyment to him; that the society of young men is apt to bore; that they belong to a new generation, whose interests and enjoyments are not his own. His views, political, social, or scientific, for which he has hitherto fought with all his energy, become moderated. Altogether, he grows more serious and sedate. The passions have lost their fervour, the intoxication of youth is gone, and he falsely prides himself on his self-control.

With the loss of the elasticity of the arteries, and the lessened nutrition of the brain, there is often a lessening of that power of concentration, and quickness of attention, upon which the sharp stamping of impressions, and

the ready recall of them, depend; hence, as we have pointed out in the preceding chapter, the memory, especially for recent events, is commonly impaired. By no means rarely, however, the memory remains vigorous and trustworthy. When actual senility has set in, a man may meander in his conversation, unconscious that he is repeating himself; he may remember the tales of long-past time, and yet forget that he has just told them. This may go on until it reaches, in extreme cases, the condition of senile dementia. Happily, it does not often do so; and it is satisfactory to note that many of the very aged are in good possession of their mental faculties, taking a keen interest in passing events, forming a clear judgment upon them, and full of thought for the present and future welfare of others. It is no less satisfactory to find that even severe and long-continued functional activity of the matured brain seems, in no way, to impair its enduring qualities; and that good, earnest, useful employment of body and mind are not only compatible with, but even conducive to, longevity. Of course, if the old have but little society, and do not read, they become mentally weak from their short rations of data. Robbed of every other

interest in life, they never think beyond their personal affairs.

Oncoming old age is the transition period from active leadership to the easy-chair by the fireside. One of the chief constitutional symptoms is a tired condition, often implying an instinctive feeling that work, exertion, and effort are not always worth while. Tasks that a man would have ordinarily run through in a short time seem now totally beyond him. The tired feeling not infrequently leads to a lowering in the desires and ideals. Pleasures that cost little, and imply small exertion, are preferred to pleasures of the higher sort, that need some strenuousness to attain them. Bad habits begin to show their cumulative effects, and the recovery after indiscretions is less certain and slower. The intellectual processes are both retarded and more difficult. There is no longer the same intuition and inspiration and former concentration.

The young man has a craving for action; the old man for rest. Youth tends to lofty ideals, and the realisation of them; but in old age hope often fails. Youth is defiant, grapples with life, laughs at difficulties and discomforts, and enjoys danger for the thrill of the thing. As we grow old, we change, lose the

zest and the capacity to endure hardships. We lose the precious gift of curiosity; become bored easily, and finally accept comfortableness as a consolation for what we have missed. There is loss of initiative in the old man, enthusiasm wanes, and the *tedium vitæ* makes him feel that the game is not worth the candle. At this stage he no longer feels willing to pay the price of sacrifice, and to struggle to maintain high ideals. The powers of aggression and resistant effort flag, and he is content with the beaten path. The brain is set for habitual reactions. There are fixed points of view. It is hard for the old man to adjust his mind to progress. As Bacon said: "Men of age object too much, consult too long, adventure too little, repent too soon, and seldom drive business to the full period, but content themselves with a mediocrity of success."

Old age lacks imagination, too. True, some of the greatest poets, painters, and sculptors have done a part of their very best work in advanced life; but that only shows that their fantasy held out longer, and that it improved by continued training and experience. In other fields it is the young man who creates novelties by his imagination, and, only too often, it is the old men who prevent him from

getting them accepted. Age, and an aversion to new ideas, and even necessary changes, seem almost synonymous. Nearly all the great systems of philosophy and psychology, most innovations in science, most great inventions and discoveries, have been conceived and completed by young men; by men under sixty, certainly. Not infrequently, however, they are shelved by the old men at the head of our colleges and universities.

Even for criminals the golden decade is between twenty and thirty, before the middle of average life.

Whilst the younger man does more original work, the older man is best at routine work; because original work requires enthusiasm, which is greatest in youth, whilst routine work requires experience, of which the old man has most. In Society both forces are needed; one makes the world move, the other keeps it steady. The rule is that, as experience increases, so enthusiasm declines. That is why old doctors and lawyers are preferred to young men, however clever. Most of our newspapers are written by young men.

If the young are the best advocates, the old are, by nature, the best judges. They can best weigh facts and ideas in the scales of

justice. There is a certain maturity of judgment that nothing in the world but years can bring, a real wisdom that only age can teach.

It is a shock to many people when, in the very height and fullness of life, they realise that hopes and plans have a mortal limit to their possibilities. Consequently, the approach of old age is a critical period for many individuals. Consequently, too, the dangers of disillusionment, depression, and discouragement as they face the approach of senescence. They begin to survey their past life, and see the many errors of their former days; the false ideals they blindly followed; and the many hours of passion they fruitlessly spent, leaving them not even the sweetness of recollection. They reflect on what might have been; they no longer look forward to the future, but ponder over the past. The retrospect is never without its sobering reflections. The work we hoped to do, and what we hoped to be, compared with what we have actually accomplished, and what we are, reveal humiliating contrasts. Some of us must needs confess that we have played the wanton with opportunity. Most of us acknowledge that we have only partially realised our hopes or attained what has been within our powers.

But it is not in what we have done, or left undone, that we come to the final test of life. That is found in what we have made of ourselves.

Sufferers from senile changes often lack the patience and the ability to throw off care. A fresh vigorous mind can ignore the disagreeable, whilst the jaded mind becomes its prey. It is a sign of persisting vitality when an old man is of a cheerful disposition, and still takes a lively interest in the persons and things about him. The disagreeable man becomes grumbling, suspicious, often querulous, exacting, and wilful. Complaints are often exaggerated by him as calls for sympathy. He is particularly prone to peculiarities, which, if they do not unconsciously alienate the affections of those nearest and dearest to him, make their continued devotion extremely difficult.

The moral faculties sometimes decline from the same cause. There may be only a loss of moral enthusiasm; sometimes, however, conscience may become less sensitive; avarice and irritability may increase with years. The old may become peevish, mean, tyrannical, exacting, querulous, and grumbling. Some become sensual, whilst others simply lose their capacity of resisting temptation and enduring

disappointment. If the social instinct fails, society may bore, friendships decline, and age may be lonely. Very often, however, moral defects arise from the native temperament and not from old age. Indeed, some old men, and especially old women, become more benevolent with advancing years, not only in their views, but in their deeds. They gain a sweeter disposition, not infrequently deriving happiness from an increased tendency to charitableness and more abundant affection.

Whilst some people age rapidly, the change with others is so gradual as not to be taken particular notice of. Indeed, the healthy old man rarely reflects on the short number of years he has still to live. If he did he would get miserable. When Napoleon said to De Belloy, the Archbishop of Paris, who was ninety-six years old: "You will live to a hundred," the Archbishop replied smilingly: "Your Majesty, why do you wish me to live only four years more?"

CHAPTER IV

THE AVERAGE DURATION OF HUMAN LIFE

NEXT, let us consider the question of the natural duration of human life. We notice that every species of animal has an average lifetime. For example, the horse averages about forty years; the cat about twenty, though most town cats die very much earlier. The ox lives to twenty-three on an average. The whale, the largest mammal, lives to one hundred years; so do the pike and carp, when not caught by the angler. The longest-lived animal is the elephant, reaching up to two hundred years. Exceptional instances apart, we are safe in assuming one hundred years, or a few years over, to be the limit of our times for man. Since more people approach that age than ever did before, we may hope that, some day, life may be extended to one hundred and twenty years; but it will be a hope only for some generations to come. Even then, if we compare the

longest life of man with eternity, it will seem to us nearly as short as that of the insects which live but a day.

The abnormal age supposed to have been reached by some people, in bygone times, need not be taken seriously; for, in the absence of official records, no exact information could be obtained as to the date of birth, especially amongst people of a humbler class, many of whom could neither write nor read. Persons of higher rank rarely lived to an abnormal age; for, though they could enjoy the comforts and luxuries appertaining to wealth and high social position, their modes of living were inconsistent with the maintenance of health; and, therefore, with the prolongation of life.

The Biblical evidence of the longevity of antediluvian patriarchs is probably mythical. But it is interesting to note that, after the Flood, there was a gradual decrease in the duration of life. Abraham is recorded to have died at the age of 175; Joshua, who lived some five centuries later, "waxed old and stricken with age" shortly before his death at 110 years; and his predecessor, Moses, to whom 120 years was assigned, is believed to have estimated the life of man at threescore years and ten: a measure nowadays pretty

generally accepted. Exceptional ages among the Greeks and Romans were probably based on estimates only. In the early Middle Ages life counted for nothing; and, in the later Middle Ages, careful researches by men who had investigated the subject of the longevity of man led them to believe that he seldom reached the age of eighty.

Valuation schedules of Life Assurance Companies show the highest ages of existing lives, in various offices, to range from ninety-two to ninety-five. It is true that some Companies report instances of higher ages; but these are not always well authenticated. It must be remembered that, previous to the year 1836, there was no registration of births in England, but only of baptisms; and that the registers were kept in the churches, and contained only the names of those therein baptised.

Whatever number of years may be taken as representing the natural term of human life—whether threescore-and-ten or a century be regarded as such—we are confronted by the fact that only one-fourth of the population attains the former age, and that only about fifteen in 100,000 become centenarians.

The improved drainage of land and improved construction of houses, the vastly

increased attention bestowed on cleanliness (personal, domestic, and civic), and on all sanitary requirements, improved hygiene, and the accumulated wealth of the nation leading to a higher standard of living, and the general advancement of medical and allied sciences, have resulted in an enormous saving of life, though mainly in the first half of life; whilst among persons of middle age the reduction in the death rate has been comparatively trifling.

Old men are no longer carried off by fever, smallpox, and other infectious diseases, as was once the case; but they still die of cancer, heart disease, nervous affections, kidney complaints, and respiratory troubles. This comes from the fact that, though the modern applications of the principles of preventive medicine and hygiene are, no doubt, operating to lengthen the average life, yet the individual is often reckless with his bodily machinery, and uses it with less care and understanding than he does his motor-car.

The number of old men in the population has greatly increased; not so much because people live longer, but because births have greatly diminished and there is an enormous infant mortality—according to the latest return of the Registrar-General, 60 per 1000.

Forty years ago it was 151 per 1000. But that there is still room for further improvement was shown recently by Sir Stafford Cripps, who has drawn attention to the fact that in one ward of a slum district in North Kensington the infant mortality was 121 in 1000, whereas in a corresponding ward in South Kensington it was only 46 per 1000; the difference being ascribed, in part, to the 13,000 basement dwellings in the former area.

One-third of all babies die before they reach the age of twenty; only one-half reaches forty, and a fifth seventy; while only a half per cent. live to ninety years of age. The infant mortality is lowest in children born of a mother between twenty and twenty-four, after which age the infant mortality increases. But this phenomenon is less noticeable where there are many children; showing that, when the reproductive powers of the mother are prolonged, the vitality of her children is not adversely affected.

The birth-rate in England and Wales for 1930 was 16·3 per 1000 persons living. The death-rate was 11·4 per 1000 total population, the lowest recorded; chiefly from cancer and tuberculosis. Altogether, mortality has les-

sened to such an extent, that, whereas in 1870 the average expectation of life, in England, of a healthy newborn male infant was 35 years, it is to-day (according to the Registrar's Report just issued) 56 years, and for females 60 years. Those who have reached the age of twenty may expect to live to 65; whereas, fifty years ago, the average was 58, *i.e.* seven years less. For those who have reached the age of forty-five, the chance of life extends, on an average, to another 26 years; when, fifty years ago, the chance was only another 21 years. Again, those who have been lucky enough to have escaped death up to their sixty-fifth year may now reach, on an average, 77, instead of the 74 years that would have completed their earthly existence half a century ago.

According to the report of the Life Extension Institute, New York, about a dozen years have been added to the average lifetime in the United States; but, as here, this has not been accomplished by prolonging the lives of people over sixty. It has been accomplished chiefly by a reduction in the death-rate under age five. There has been little extension of life beyond the age of fifty.

A German official table gives, for the decade

1871–80, the average lifetime as thirty-eight-and-a-half years; and, for 1924–26, fifty-six years, which means that nearly twenty years have been added to the expectation of life. According to Dr. Hans Ullmann, of every 1000 persons in Germany in 1860 there died forty persons; in 1900, twenty persons; and in 1922, ten persons.

In regard to sex, women live longer than men, about four years. Although more boys are born into the world than girls, the girls, after the tenth year, outnumber the boys owing to the higher mortality of the latter; and thereafter, to the end of life, the proportion of females to males steadily increases, until (according to Sir Humphry Rolleston, President of the Royal College of Physicians, "Some Medical Aspects of Old Age") "at the age of eighty-five and upwards there are 645 females to 355 males in 1000 living at that age group." Sir Humphry Rolleston also stated that "out of 691 reputed centenarian deaths, registered in England and Wales, during the ten years 1910–19 inclusive, 504, or 70 per cent., were females, and 187, or 27 per cent., males." According to the latest Registrar's report, there are in England 91,000 men and women over eighty-five years

of age; the women outnumbering the men by nearly 2 to 1.

Marriage would appear to be conducive to longevity, probably due to the fact that married folks take more care of themselves, lead more regular lives, and have greater domestic comfort than those who have no such tie. A humorist has said that life *seems* longer to married men than to single ones; but statistics prove that if a man married at the age of twenty-seven, the probability is that he would live another forty-two years; whereas the single man's average is five years less. Besides, married life, by promoting morality, eliminates the risks attendant on promiscuous sex indulgence.

It must be remembered, however, that the mere fact of marrying indicates superior vitality and vigour in so undertaking the care and responsibility of a home and the bringing up of children. The ranks of the unmarried include large numbers of physically unfit, defective, and ailing individuals.

The reason why married men, on an average, live longer than single ones was explained by Herbert Spencer on three grounds: (1) that men who marry have stronger instincts and more vital energy; (2) that the ability to

earn means of support, enabling men to marry, implies stronger health; (3) that female selection determines that the more attractive and healthier men should marry. It might be added, also, that men would select the more attractive, healthy, and energetic woman. On that ground alone, married folks would have the best chance of a prolonged life.

But, if married life is one of the best means to defer old age, it is positively certain, on the other hand, that unhappy marriages, on account of the anxiety and worry that they cause, are the surest means to an earlier grave.

As regards occupations, there are some, of course, which obviously tend to shorten lives; such as those of miners, plumbers, matchmakers, sawgrinders, quarrymen, woolsorters, etc. In the professions, the medical man's average duration of life is decidedly low. On the other hand, clergymen used to show a longer life; at all events, before their income was so disproportionate to the average earnings as it is to-day. Only successful lawyers appear to attain a great age; as may be seen in the case of many of our judges. Of eighty leaders of the legal profession who died between 1888 and 1929, nearly a third reached fourscore years.

Humorists, philosophers, and historians appear to live long. A philosophical mind, interested in the study of nature and the search after truth, besides affording the purest of human enjoyments, appears to have a tendency to promote longevity. Plato was 81, Newton 85, Kant 80, Galileo 78, Buffon 81, Herschell 84, Franklin 84, and Herbert Spencer, though an invalid, died in harness at 83; Darwin, too, completed one of his greatest works toward the close of his life.

The group which represents the weakest side of longevity is that of the novelists, dramatists, and poets; probably because many of them lead, or used to lead, more irregular lives. However, Goethe lived to 83, Wordsworth to 80, Corneille to 78, and Victor Hugo died at 83. On the other hand, Shelley died at 29, Keats at 25, Byron and Burns at the age of 37.

Among artists (painters, sculptors, architects, musicians, actors) longevity is also not marked, especially in regard to painters and sculptors; though there have been some happy exceptions :—Michel Angelo reached 89 years of age; Titian, 99; and there are many other instances.

Some years ago the Registrar-General pub-

lished a Blue Book which contained comparative death-rates among occupied males, from which the following figures are extracted :

Comparative Mortality from all causes.

Clergymen, Priests, Ministers	443
Agricultural Labourers	470
Farmers	495
Railway Guards, Porters	607
Barristers, Solicitors	627
Builders	656
Physicians and Surgeons	693
Coal-miners	727
Barmen	1,724

It will be noticed, as already mentioned, that medical men are "bad lives" from the life insurance point of view, although they are not as bad as publicans. Publicans have to pay double premiums. The high mortality among doctors may be explained by their leading a very active and often strenuous life; having irregular meal-times; being called out at all hours of the day and night, and in all weathers; and rarely having a proper holiday.

One reason why men of superior brain power, contrary to expectation, sometimes compare

unfavourably in length of life is because the brain is not only the organ of the intellect, but also of the emotions and passions; and the latter tend to exhaust the vitality. To the strain of intellectual life there is often added emotional disturbance owing to poverty in early youth, frequent disappointments, lack of appreciation, and the consequences of a sedentary life and unhygienic surroundings. An exception are men of science, who, owing to their minds being centred on the problems in the solution of which disturbing influences are deliberately set aside, have a high average of longevity. They are to a large extent free from the baleful emotivity which is a frequent accompaniment of creative genius. They are not the slaves of passions which wear out the body.

CHAPTER V

WHAT IS LIFE?

THE human body is a living, automatic, self-reproducing and *self-repairing* machine, which is animated and set to work by a form of energy which we call life. The germ itself, by means of which life is perpetually transmitted, is a highly complex centre of potential energy; and the organism it gives rise to, which is perishable, is another complex of energy. On the other hand, the maintenance of life consumes no energy. Life borrows from the external world all the energy which it expends; it captures and stores energy; and the functions of the body merely transform and release that energy.

According to Professor Crile, the famous American authority, "The processes which distinguish the living from the non-living are due to electrical forces within the protoplasm, which endow it with the essential processes of irritation, assimilation, and re-

production;" and Wishnjakoff, the Professor of Biology in Moscow University, claimed to have discovered that the germ cell is akin to a radio-active body, a radio-active element entering into the composition of living matter, namely, potassium; and he traced many hitherto unexplainable phenomena to this source. There can be no doubt that a force resembling electricity, if not identical with it, is constantly generated in the body, and that its tension is dependent upon the state of health of the subject. It has long been known, since the fundamental work of Du Bois-Reymond, that feeble electric currents are produced by every contracting muscle; and that an electric change is associated with every passage of an impulse along a nerve; and it is now generally recognised that all vital processes have their associated electrical currents. In fact, all matter, both living and lifeless, is but electricity. The whole living body may be compared to an electric battery. According to Crile it is a bipolar electric mechanism. The human body is an apparatus run by billions of leectric cells; each cell being a little wet battery, with negative and positive poles. In fact, "Man is simply a mechanism run by electricity and

chemical reaction," and "the brain is the chief power station." Each of the 14,000 millions of tiny brain cells is a miniature storage battery, and our nerves are wires equipped with sub-power stations, and are something akin to switches and keys to check, or block, or release electricity flowing through them, and operating the motors of the muscles and the organs; and practically every other cell in our body has a part in the creation and distribution of this electricity, which is, literally, the vital spark.

It is well known that the severing of nerve connections between the brain and a muscle leads, not only to paralysis, but to the shrinking or atrophy of that muscle; but that, if a muscle be made to contract at certain intervals by electric stimulation, no atrophy of the muscle follows. Electricity does for the muscle, so far as its function and nutrition are concerned, what the brain does for it. "Therefore," says Professor Crile, "electricity is adapted to the muscle, and the muscle is adapted to electricity." He quotes Professor Piper, who showed that "sound waves originate an electric current in the auditory nerve," and Professors Einthoven and W. A. Jolly, who discovered that

"when light falls on the retina of the eye an electric current is produced in the optic nerve."

Electrical energy is constantly leaving the body. If the health is poor there is little emanation. That we do give off electrical energy, at least under the influence of emotions, has been verified by experiment, and every psychological laboratory is now provided with an instrument to measure this energy.

Professor Adrian of Cambridge found that nervous impulses are given off in minute electrical waves, and he invented an instrument by which he could enlarge and measure them. Recently, Professor Ecripsy, of the Electro-technical Institute of Leningrad, has also invented an apparatus for the measurement of human rays. Among other electrical instruments invented to measure the invisible energy given off is one by Sir Jagadis Chandra Bose of the Presidency College, Calcutta. Professor Schweninger confirmed the electric radiation emanating, especially, from the human hands. Electric brain waves have been studied by Professor Berger, Director of the Psychiatric Clinic in the University of Jena, further by Jacobson and

others; and Professor Cazzamali invented an instrument for their measurement. The well-known surgeon Professor Sauerbruch and the psychologist Dr. Schumann have demonstrated that the electricity of the human body can be registered at a distance of two metres.

It has further been shown, by means of the galvanometer, that electrical changes are associated even with the streaming movements of the protoplasm in the cells of certain plants; and the same fact was demonstrated on a living green leaf exposed to sunlight. Professor Bayliss ("Principles of General Physiology") has proved that "vegetable protoplasm in a state of excitation is electrically negative to that at rest."

The late Professor Waller, of University College, was a pioneer in the application of electrical methods to the study of life. He found that the vitality of seeds could be measured. There was no need to wait for the spring and the sowing to see if they would sprout. If they were all freely and fully alive, as good seed should be, they gave a definite electrical reaction when compressed; if they were dead and useless, compression left the galvanometer untouched. He also

found the lens of the eye to be electrical, and has further shown that the hen's egg will give an electric current just as soon as the almost invisible speck, representing the future chick, is constituted on the surface of the yolk. He concluded that "Inasmuch as chemical change being a sign of life, and electrical change a sign of chemical change, it follows that electrical change is a sign of life."

We know that electricity is generated in the lungs with every inspiration, and is conveyed by the blood-stream to every cell in the body, the brain receiving the larger supply, and representing the seat of the highest potentials. No two persons are exactly alike; but the average electromotive force of a living human being has been estimated to be about five millivolts, the measure being taken from hand to hand, through the coils of a sensitive galvanometer by means of suitable electrodes. The activity of the heart, too, generates electricity. On this depends the use of the electric cardiograph.

Professor Fraser-Harris, in his interesting work on "Life and Science," tells us that "When a muscle is dead in all other respects, it can still give an electric current on being adequately stimulated. An isolated heart,

even after it has ceased to beat, as far as the unaided eye is concerned, can still spontaneously evince electric disturbance." And there are instances on record in which this fact has been utilised in prolonging, for a brief period, the life of people dying of heart failure.

According to Professor Hans Berger, "The magneto of an automobile presents many points of resemblance with the brain. Breakdowns of the magneto are comparable with breakdown of the brain. If we isolate a man on a wooden table standing on glass feet, and he puts one hand into a basin of salt water, and the foot of the opposite side into another basin of salt water, and we then link up the two basins with a control electric apparatus, we find that with each cardiac contraction an electric current passes. We are therefore electric machines; machines that work by electricity. The nerves in their isolating sheaths and their conducting fibres represent electric cables."

A. V. Hill, Foulerton Research Professor of the Royal Society, has explained that the long thin living threads of nerves carry—like the wires of a telephone system—messages between different parts of the body; and our replies to these messages, the orders

we send to our muscles, are also streams of waves, starting out from the nervous system which lives, well protected, inside our skulls and backbones. The messages are like waves, and are almost certainly of an electrical nature; not like wireless or light waves, but "waves of electro-chemical change," partly chemical and partly electrical. But chemical action itself is held to be identical with electric action, for it is the repulsion and attraction of unbalanced negative and positive elements that make compounds, solutions, and colloids. If there were no atomic, no intermolecular, no electric phenomena, there would be no compounds, no solutions, no colloids, no life.

The nervous system having been proved to be electrical, it need excite no wonder that, ever since the time of the great neurologists, Erb, Du Bois-Reymond, Duchenne, Charcot, electricity has been medically applied to all diminutions of energy and sensibility, to the various species of depression and decay in physiological vitality, as a regenerator of endangered vitality, and whenever there is loss of virility, by which term we mean not simply the power of propagation, but the whole part played by a man in his work.

It will ward off senility with its mental and corporeal manifestations, and improve the general health. For methods we must refer to works on treatment by electricity.

By means of a galvanometer we can catch and record the slightest movements in living matter, even the secretion of a gland. It seems, therefore, that electricity and life are fundamentally related. When, owing to disease, or the wearing out of old age, the battery ceases to function, life is at an ebb. If electricity plays such an important part in all vital processes, it is not surprising that, properly applied, it proves to be a most useful therapeutical agent for the preservation of health and the restoration of bodily energy. Its importance in the treatment of paralysis and a number of other disorders and diseases is admitted.

The fact of the body being electrical may explain an ancient rule of life, taught by physicians throughout the ages, namely, "Keep your vitality above par," which means, see to your vital energies; do not let them run down by over-exertion, physical or mental fatigue; and especially, emotional excesses; and you will be able to resist disease. There exists no law that so many

people must suffer each year from certain diseases. If the vital energy be kept normal or super-normal, the body naturally resists all such attacks with ease, because the inner forces will be able to resist invading toxins. *Disease is contagious only to a weakened organism.* A man in good health may swallow germs all day long and never develop any disease. Indeed he does swallow them, if the germ theory be true.

The electricity of the body will explain another truth, not sufficiently recognised, which is that "Nature heals," the physician only aiding the process by putting the patient in the right condition for the healing process to be facilitated. The patient may, and can, by his thoughts, accelerate or retard the healing; but he is bound to recover if he has the necessary vitality. As R. T. Cæsar, referring to electro-therapeutics, said: "We are, after all, only making use of *Nature's own remedy*. An electric current is set up in our bodies whenever a muscle is used or the heart beats. Whenever any part of the human body is injured, a current is caused, and flows in a definite direction, and can be measured. This electric current must, therefore, be necessary, and probably acts by stimulating

the various cells of the part to increased work; thus leading to repair of tissue and absorption of deposits."

In senescence, as in many forms of neurasthenia of younger people, the nervous energy gets considerably diminished. The loss of energy and degree of exhaustion can be measured by means of the galvanometer, and this measure is an aid to diagnosis; for, often, the ordinary medical examination may reveal nothing abnormal in any of the organs, except perhaps a sluggishness in the reflex actions, or a lack of vigour in the pose and movements of the patient. For such a test we must know, of course, the average of response we may expect to get in a "normal" person of that age to a galvanic current of the identical strength.

Electro-therapeutics seems to be better known and more extensively applied on the Continent and in the United States of America than in England, where it is still regarded by many physicians as a kind of medical poor relation, and the simpler forms of application —galvanism, faradisation, and electrical massage—have been largely relegated to unqualified persons: or, at least, to persons who were taught in a course of six or twelve

lessons all that was supposed to be necessary. Consequently the whole subject is considered on a par with massage and Swedish physical exercises, as perhaps a useful adjunct to other treatment, but of no definite value. Consequently, too, there is a considerable commerce done by unqualified laymen, whose advertisements fill the pages of the lay press with glowing accounts of cures of almost any disease.

It is my conviction, based on forty years' experience, that electro-therapeutics deserves closer investigation and more recognition than it has hitherto received. Considering that we do not know what electricity is, and that the study of its practical effects on the human body is still in a very primitive stage, neither laymen nor professional masseurs—who now combine the practice of electricity with massage—are likely to advance our knowledge. Moreover, the failures of these electrical practitioners, and the not infrequent harm they do, is apt to be pointed to as proving the uselessness and dangers of electricity; whereas, in truth, their ignorance is to blame.

In Chapter VIII will be shown the beneficial effects of electricity when combined with radium emanation treatment.

CHAPTER VI

THE CHEMISTRY OF THE BODY

BEFORE we go any further it will be necessary to explain, briefly, the chemical nature of life. For this purpose we must first of all call attention to the fact that we have, besides the nerves of the five senses, two systems of nerves: (1) the voluntary or cerebro-spinal, and (2) the involuntary or sympathetic. The *cerebro-spinal system* originates in the brain, and runs inside the spinal column in the hollow of the vertebræ. It consists of nerves of sensation, which carry messages from the surface of the body to the brain; and of nerves of motion, which, in response to the sensations, carry out muscular movements. The *sympathetic system* is situated within the body along each side of the spinal column and consists of a number of collections of nerve matter, so-called ganglia, from which come off fine networks of nerve fibres which go to all the internal organs as well as to the blood-

vessels, glands, and to the cerebro-spinal nerves, helping to increase or check muscular movement.

When the response to an external stimulus is effected through the voluntary or cerebro-spinal system, there results a motion, a movement. When the response is effected through the involuntary or sympathetic nervous system, there results a feeling or emotion. The cerebro-spinal system of nerves is thus commonly associated with voluntary, purposive acts, with consciousness, will, and the joyful and expanding emotions, and brings the individual into relation with the outer world; while the sympathetic system has to do with nutrition and the preservation of the body, and is associated with unconscious acts which, when they become conscious, we recognise as contracting and painful emotions, such as fear or anger.

Our will directs our movements, and, to a large extent, our thoughts and actions; but the great laboratory work of life, silent and almost unseen, is carried on outside our will, and outside our consciousness. Thus, the heart is an organ of which, as a rule, we are not conscious, and on which we cannot act by our will; but when we become subject to some

emotion, we can feel the heart and its contractions.

The general nutrition of the body is influenced by certain mental states, through the sympathetic nervous system, which is concerned with all the vital processes, including breathing, the circulation of the blood, digestion, assimilation, oxidation, elimination of poisons, and the action of the skin and bowels. It regulates the beating of the heart, blood-pressure, breathing, digestion, and the perpetuation of the race. It is concerned in the healing of the body, and in the process of defending it against disease. Altogether life depends on it.

Important discoveries have been made within recent years, proving that the sympathetic nervous system stimulates the secretions of the ductless glands; and that these secretions, in turn, increase the sympathetic response and affect our emotions. These secretory glands are called ductless glands, because there exists no visible duct (or tube) whereby their secretions may be conveyed away from the gland. The secretions formed are absorbed indirectly into the blood through the cells of the gland and the walls of the lymph and blood-vessels. These ductless glands, as well as allied glands,

not ductless, produce chemical fluids which are discharged into the blood-stream, and are carried by it to all the organs of the body, upon many of which they take effect—the effect varying with the organ.

Modern science claims for these ductless glands—also called the endocrine glands—a very important position in the organism, saying that it is their secretions which supply the stimuli, give the tone to, and keep in order, the whole body, by supplying to it some necessary chemical. It is held, for example, as one effect, that the endocrine content of the blood has much to do in causing a person to be energetic. If and when these glands lose their power, and become obsolete, decay sets in. Consequently, whereas formerly it was said that "a man is as old as his arteries," nowadays it is more correctly said, "he is as old as his ductless glands." Thus, it would appear that the body manufactures its own drugs. These are supplied by the glands of internal secretion; and not only have they the power to correlate and co-ordinate the various bodily functions, but they also destroy toxins; and, further still, these chemicals—these "hormones," as they were called by Professor Starling—control one another.

The Thyroid Gland

Probably the gland that is best known is the thyroid gland, a ductless gland situated in the neck, in front of and on either side of the windpipe. The thyroid gland sets the tempo for life. According to Crile, the thyroid gland is essential for the production of the kinetic drive, a term which implies an increased transformation of latent into active energy. As old age advances, the thyroid produces less and less energy, and we gather gradually the impression that we are growing weak, helpless, and that anything is too much for us. In brief, we begin to experience a feeling of inferiority. Then in the intervals of our blues, when we would undertake something of value demanding a certain expenditure of energy, we are assailed by doubts as to whether we are equal to our tasks.

It is believed that the function of the thyroid secretion is to handle the iodine which enters the body as food, producing a compound which regulates the level of energy-production in the cells of the body, and has been shown to increase the electric conductivity of the brain. Consequently, if a man has a strong thyroid he will be mentally energetic; and, if he has a weak thyroid, he will be sluggish and lazy.

The late Sir Victor Horsley held the view that senility is due, at any rate in part, to thyroid degeneration. This theory was founded on the fact that, in old age, this gland becomes atrophied, its follicles shrink, and retrogressive changes take place in the epithelial cells. The theory was reinforced by the fact of Sir Victor Horsley observing a profound analogy between the signs of advanced old age and those of a disease called myxœdema, in which there is also a degeneration of this gland, followed by loss of hair and dropping out of the teeth, dry and wrinkled skin, lowered body temperature, diminished perspiration, indolent digestion and consequent emaciation, reduced tissue change, decrease of mental power, and diminished activity of the whole nervous system.

When the thyroid secretion is very deficient in infancy, it may be the cause of idiocy and stunted growth (cretinism); a condition which can be treated by the administration of thyroid extract. When the secretion is greatly in excess, it may cause a swelling in front of the neck—known as goitre—and affect, profoundly, the rapidity of the heart and the general nutrition of the body, besides inducing a highly emotional and nervous state.

The Suprarenal Glands

It is unnecessary to describe here all the ductless glands; but there are a few important ones; among them, the suprarenal, also called the adrenal gland, placed over each kidney. The suprarenal secretion, called "adrenalin," seems to be the active agent that enables us to meet successfully the great emergencies of life, and to promote the rapid response to their demands that safety needs. It is the automatic activator of the whole sympathetic system. It stimulates the liver to discharge its sugar, which again is an energising substance, necessary for muscular activity. So that the purpose of the two chief endocrine glands is to regulate the chemical energy of the body.

When under the influence of healthy emotions, the suprarenal gland, in common with other glands of this class, will perform its work in a natural, normal manner; whereas such emotions as anger, fear, and constant depression result in an over-production of its secretion and disturb the bodily health. If the emotion is continuous, the increased secretion results in raising the blood pressure, and, in course of time, causes high vascular tension and hardened arteries.

The Pituitary Gland

The pituitary gland, situated in the brain, has two portions, an anterior and a posterior one. The anterior lobe, if over-active, causes giant growth of the skeleton; and if destroyed by disease, a dwarf-like stature. An overgrowth of the anterior part in adults causes a disease called acromegaly, in which the hands, feet, and lower jaw grow abnormally in size. This anterior portion provides, besides, a stimulus to the ovarian function. On the other hand, the reproductive glands arrest the function of the pituitary gland, thus slackening growth at puberty.

The hormone of the posterior lobe of the pituitary gland acts on the involuntary muscles, such as those of the womb, and is extensively used to increase the activity of the pregnant uterus in confinements.

The Pineal Gland

The pineal gland is situated in the brain, and its destruction has a marked effect upon the development of the sexual system. It often causes precocious puberty. Normally, it has a restraining influence upon the development of sexual maturity.

We shall deal with the sex glands in the next chapter.

CHAPTER VII

THE PRESERVATION OF VIRILITY

EXPERIMENTAL research has demonstrated that bodily and mental vigour depend, not only to a large extent on the efficacy of the different glandular secretions, but, especially, on the secretion of the sex glands. These glands pass into the blood an internal secretion, and, in the male, produce, in association with the pituitary body and the suprarenal glands, the various attributes summed up in the term manliness or virility.

The sex glands are not merely for the reproductive function, but vitality and vigour depend on their healthy state. *Senility is, to a large extent, a result of decay of the sex glands ;* there is a growing disinclination for bodily exertion and mental effort, and a decreasing potency.

The sex glands are of a twofold nature. The strictly glandular elements produce the reproductive cells, the spermatozoa, or the ova, as the case may be, which pass from the

gland through a duct into the outer world, or into a body cavity. On the other hand, the interstitial tissue of the reproductive glands produces a secretion—a hormone—which passes directly into the blood-stream, to cause and maintain the totality of the bodily and mental sexual characters. The maturity of the body and mind (not sexual alone) is produced by the hormone secreted by the reproductive gland, and the passing of maturity, the onset of old age, is dependent upon a cessation of this same hormone production.

The purely sexual function depends on three centres : the cerebral, giving the desire ; the lumbar in the spinal cord, giving sustenance ; and the sex glands themselves, which, in progressive years, may no longer normally function, whilst the other two—or one of them—persist, and even increase in intensity. Consequently, sexual desire may outlive the physical potency ; and this situation may lead to unpleasant or perverted behaviour on the part of old men lacking in self-control.

When we study the history of people who reach an extraordinary old age, and keep their youthful appearance late in life, we find a strong sexual activity in most of them (though it may be under perfect control), and this is

only possible by being possessed of healthy and strong sex glands; and thus it would appear that the proper functioning of these glands is one of the conditions of a strong vitality and that their preservation adds to the probability of a long life. That people with strong sexual impulses very often do reach an advanced old age is evident by many examples in the history of the world.

Age, then, is in some way associated with the reproductive function. With the atrophy of the sex glands the vigour of the brain and nervous system diminishes, and all the other glands and organs also diminish in their activity, so that body and mind age. That the state of the sex glands has an influence on the proper working of the brain is best proved by the observation that in cases of testicular or ovarian insufficiency, intelligence is often diminished. On the other hand, we may see a precocious highly developed intellect in children with a premature sexual development. As regards the instinctive dispositions—courage, for example, is a specific feature that can only be found in a man who is still in possession of healthy sex glands; it is entirely wanting in eunuchs.

The connection of the sex glands with

longevity is confirmed by the observation that families with a large number of children are generally long-lived. On the other hand, no eunuch reaches a very advanced age. At the first International Congress of Studies on Population, held in Rome, the President, Professor Gini, discussed the relation of large families to longevity and made an interesting observation. He remarked that all the offspring, both male and female, of long-lived persons had families larger than the average, which made it clear that fecundity went hand-in-hand with longevity. Further, that the fathers of large families nearly always came from families in which the males predominated; and similarly the mothers from families in which the females predominated.

Castration in man, before the age of puberty, is well known to prevent the growth of hair on the face, to arrest the growth of the chest and pelvis; and of the larynx, so that the voice of childhood is preserved. At the Papal court, choir boys with exceptionally fine voices used to be castrated in order to keep their voices high-pitched.

These are secondary sex characters, and there is no doubt that they are due to the internal secretions of the sex glands. Such

secondary sex characters in animals are the lion's mane, the cock's comb, the stag's antlers, the difference between the bull and the ox, the stallion and the mare. Ingrafting of a reproductive gland, as we shall show, tends to cause the secondary characters to be restored.

With the decline of the sex function there is a progressive loss of energy, chronic fatigue, lack of aggressiveness, disillusionment, mental depression, and a gradual lowering of all activities. Professor Swale Vincent mentions Zoth and Pregel as having obtained definite proof, by means of ergographic records, of the stimulating action of testicular extracts upon the muscle-nerve apparatus in man. They found that injection of such extracts not only causes an increase in the amount of muscular work which can be accomplished, but lessens the subjective fatigue sensations. Loisel believes that one of the functions of the internal secretion of the testis is to destroy fat in the body. For this reason men are thinner than women, and castration in man before puberty causes the eunuch to become in adult years tall and thin; whilst late castration produces the fat eunuch.

Brown-Séquard found that subcutaneous injections of extracts of testis exercised con-

siderable influence upon the general health, as well as on the muscular power and mental activity. The experiments were performed upon himself when he was seventy-two years of age, and he described the very marked rejuvenating effects. Professor Swale Vincent thinks it probable, however, that some, at least, of Brown-Séquard's personal benefit under this treatment is to be attributed to suggestion. As a matter of fact, he died five years later.

Steinach and Voronoff have invented operations for "rejuvenation," based on successful experiments on lower animals; but there is still considerable doubt as to their successful application to man, the failure being probably due to the fact that, in most people, at the age when the operation is usually undertaken, one or other of the bodily organs is already gravely compromised.

Steinach's experiments on animals led to the observation that the sex function is dependent on the internal secretion of the interstitial testicular tissue. Ligature or section of the vas deferens (sperm duct) leading to the gland—a simple operation, usually done under local anæsthesia—results, it was proved, in an increased discharge of the testicular hormone, which, pouring into the blood, acts

in a stimulating manner on the entire internal glands and on the central nervous system by way of the circulation. But it should be remembered that the pituitary and adrenal glands are also connected with the sex function; and there is a relationship between the thyroid and the female reproductive gland. Altogether, it is now known that the endocrine glands never function separately. Each influences the other in a communicating chain. Let one be disturbed, and all the others will feel the impact of the disturbance and vibrate with it.

Since the female sex glands—the ovaries—are too deeply seated, the operation cannot be performed on women, and quite a different treatment—internal electrical heating, by diathermy—is adopted.

Steinach certainly succeeded with animals; rats and guinea-pigs. He was the first to produce a transformation of sex characters by removing the ovaries of a young female guinea-pig and ingrafting the testicle of a young male; and replacing an ovary for the testicle removed from a male guinea-pig. The effect that was produced was entirely by the interstitial part of the gland, and the production of the germ or sperm cells is in no way connected with it.

When the young female animal with the ingrafted testicle became sexually mature, it displayed marked male characteristics. It developed masculine size all round and even the reproductive organs came to resemble those of a male guinea-pig, whilst the mammary glands and uterus remained undeveloped. On the other hand, the castrated male guinea-pig with the implanted ovary remained of slender build, the mammary glands became strongly developed, and the male genital organs remained atrophic.

However, the product furnished by the sex glands represents a stimulant, and not a substitute for destroyed or consumed cellular elements. Therein lies the danger for persons whose other organs have grown old and defective, as in the notorious case of a German patient who, six months after being operated upon by Steinach, died in an asylum; and the similar case of an Englishman who arranged to deliver a lecture at the Albert Hall in London, on " How I was made twenty years younger," but died the day before that fixed for the lecture (presumably from heart disease). Moreover, Steinach's operation is intended for " premature " senility; not for actual advanced senility.

Further experiments and a longer period of observation are necessary before we can accept Steinach's results without reserve; but it must be acknowledged that they are perfectly reasonable, and that they follow as a logical sequence of many years' observation and experiments in this field.

Dr. Peter Schmidt repeated Steinach's experiments and rejuvenated various senile dogs with success. But, as mentioned, in man *only the ageing organism* is fit for regeneration; when the body is already quite senile, no good results can be expected. It further appears that, even when this method is successful, the signs of rejuvenation disappear very soon. Finally, restoration of the potency, to which the term rejuvenation is so often restricted, can be achieved by other and simpler methods. Anything that increases the general vigour of the body and nervous system is likely to increase the functional activity of the sexual system. This does not say that the Steinach method may not be the more effective, only that the method is not yet so perfected as to make it reliable.

Voronoff's method consists of the transplantation of a sex organ from a chimpanzee to man; but the results of transplanting animal

tissues into the human body have always been disappointing. The human body treats these imported portions of animal tissue in the same way as it deals with other foreign bodies; it may throw a protective covering of elementary tissue over them, but it declines to admit them into its working. Although there may be, as is the case with the Steinach operation, a temporary improvement in the patient's condition, due to the accumulated internal secretion in the gland transplanted, the gland will not live, and in consequence will produce no further supply of the secretion in its new home. Yet, again, on animals, this method was highly successful.

One of Voronoff's most striking cases was that of an old ram of twelve years—nearly the ram age limit—who was so senile and decrepit that he could hardly walk. Voronoff grafted into this old worn-out ram a sex gland from a two-year-old animal. A few months later the old ram was to all appearances a robust, virile, and splendid animal. Perhaps the most significant result obtained was that the rejuvenated ram sired a fine lamb from a young mate. The grafted gland tissue could not directly have caused procreation because it had no duct. What it probably did was to stimulate

and revivify the old ram's senile glands and thus restore the function of procreation—a most startling result. To leave no doubt as to cause and effect, Voronoff removed from the rejuvenated ram the gland grafts. The animal quickly lost its renewed youth and again became senile and decrepit. Once more Voronoff grafted new gland tissues, and, for the second time, the senile ram became rejuvenated as completely as before.

Other surgeons have tried Voronoff's method on a number of aged men; for instance, Dr. Bachrach of Vienna, who reported that "In only one case—a man of seventy-four—has the implantation of testes (of a baboon) resulted in restoration of mental and physical activity; and even in this solitary favourable case the improvement was not permanent, and some of the troubles of senility soon returned." But Bachrach thought that "the advanced senility of his patients was chiefly responsible for the negative results; the selected patients had no reserve forces, and the presence of such reserves is a *sine qua non* for the reactivation of manhood."

It is a mistake, as we have already pointed out, to suppose that rejuvenation, in the sense of a return to younger years, is possible. All

we can do is to reactivate the bodily processes so as to prevent or reduce premature signs of senility. This can be accomplished by other methods without having recourse to surgical operation; for example, by making up the glandular deficiency medicinally, and administering it by injection, or by mouth, which is now the method followed by a number of physicians. This method is based on the use of the juices and extracts of the chief endocrine glands, to remedy the absence or hypofunction of an organ, by means of extracts of similar organs taken from animals.

Just as we can, in failure of the thyroid to perform its functions properly, replace the lacking hormone by administering thyroid extract, and just as we can, in disorder of the pancreas followed by diabetes, give insulin, so we can supply the testicular hormone in decay of the reproductive gland, and treat the consequent senility without treating its specific symptoms. The physiological difference between the young and the aged is the condition of the nourishment supplied by ductless gland secretions. Therefore, " premature " old age and its attendant ills may be deferred by supplying the deficiency.

The effects of some of the horrible animal

concoctions prescribed in the Middle Ages must have been due to the fact that they contained the essence of these glands; and the Chinese, from ancient times to this day, prepare glandular extracts for the cure of sexual weakness.

But this method, too, still requires perfecting. It is only in certain conditions that it can be determined which of the glands is really defective in function; and, since most of them act together, and others tend actually to be antagonistic, it is difficult to determine in what proportion they are to be given. An excess of any one of them may produce morbid symptoms. There are an enormous number of commercial preparations of these glands on the market, showing that there must be a considerable demand for them. One pharmaceutical firm competes with another in the production of these multiple glands, each one claiming perfection. No wonder that some experts cast doubt on their efficacy; for instance, Professor A. J. Clark and Swale Vincent. The general principle of endocrine therapy is sound, but we want considerably more experience. Often they act beneficially on one individual and produce no effect on another. The problem, in my opinion, is how to ensure absorption.

CHAPTER VIII

ONE OF NATURE'S REMEDIES FOR PREMATURE SENILITY

MANY of the European baths, famous to-day for their health-restoring and rejuvenating power, were known to the ancient Romans. Yet it is only in our generation that the real reason has been discovered for these natural springs having such beneficial effects, namely, owing to their being "radio-active." It was M. and Mme. Curie who discovered the radium element in uranium pitchblende, coming from Joachimsthal in Czecho-Slovakia, one of the richest mines in Europe in this respect; and subsequent investigations disclosed that the emanation—the gas—given off by the radium was radio-active and had certain definite health-giving properties.

More popular and renowned for its rejuvenating powers than the Joachimsthal spa, and possessing a higher degree of radio-activity, is the Austrian radium spa, Gastein.

Among its devotees have been some of the most famous rulers and statesmen of Europe, who have not only lived to a great age, but showed extreme freshness and activity at a very advanced period of life. We may mention the Emperor William I of Germany, Bismarck, and the Emperor Francis Joseph of Austria. The late Lord Balfour, too, was a regular visitor, going every year to take the waters. These waters contain no mineral salts or chemical properties of any kind, unless in ionised form; but are merely plain water charged with radium emanation. Gastein is situated amidst most beautiful Alpine scenery and its numerous hotels are each supplied with the water from the main springs and have their own radium baths, so that the visitor has not to walk, or be carried, to the baths as in most other well-known spas. Other springs of lesser radio-activity are those of Kreuznach and Pistyan, with radio-active brine baths, Baden-Baden, Wildbad, and several others which enjoy a high reputation.

Bath and Buxton are the two spas in Great Britain with radio-active waters, known chiefly for giving relief to patients suffering from gout, rheumatism, and fibrositis.

The ingestion of the Bath waters, "taken

in judicious amount and at suitable times, increases the appetite and improves digestion" and is "rapidly followed by free diuresis." The official report, from which these quotations are taken, states that "considerable attention is being given at Bath to the preventive side of spa treatment, the object being primarily to increase elimination," and "by improving the blood supply and nervous reactions of the tissues and organs generally, coincident with more rapid removal of waste products, to stimulate chemical activity and improve general metabolism."

The Buxton springs come next in radio-activity, and are also famous for their diuretic effect, which makes them eminently suitable for arthritic diseases and arterio-sclerosis.

The Droitwich brine baths are also renowned, though their radio-activity is smaller than that of the others.

There has been some doubt whether the radio-active elements of these baths-waters ever enter the body; probably they do by their "ions" penetrating through the skin. However this may be, there is undoubtedly a strong and unmistakable effect produced by the mere inhalation of the powerful radium gas steaming up from the bath, as

I have personally experienced at Gastein. That the inhalation has considerable beneficial power is supported by the fact that those visitors who do not take a cure seem also to derive benefit from inhaling continuously the atmosphere surrounding them; and that the workers in mines where pitchblende or other radio-active bodies are found are particularly immune from the diseases for which radium emanation is applied.

Many eminent continental physicians—Professors Neusser of Vienna, Czerny of Heidelberg, Kraus and Lazarus of Berlin—have found in radium emanation a successful treatment for the diseases mentioned, namely, gout, rheumatism, and other forms of arthritis, as well as neuritis; and, above all, for arterio-sclerosis with high blood-pressure. All these diseases are largely due to defective metabolism, for which radium emanation is most effective. Professor His has confirmed that, through the use of radium emanation, the blood entirely loses its content of uric acid, and the patient feels, as he says, "born all over again" (*Medizinische Klinik*, 1916). Howard Humphris and Herbert Rutter (*Lancet*, 1915) have shown the beneficial effect of radium emanation on arterio-sclerosis.

According to Chambers and Russ (*Proceedings of the Royal Society of Medicine*, 1912), radium emanation has a powerful bactericidal effect, due to the emanation itself, for a very thin sheet of mica considerably diminishes it.

Bouchard, Curie, Balthazar, Saubermann, and Lazarus have found that "Radium emanation circulates with the blood and tends to diffuse itself throughout the tissues. *It has a predilection for the glands which form an internal secretion.* It is eliminated chiefly by the lungs; less by the skin; and to a small extent by the kidneys." The powerful action of this gas, taken in solution in water, by inhalations in the lungs, or by local applications of radio-active earth (refined pitchblende), is no longer disputed. But radium emanation itself does not cure. It only strengthens the general vigour and the body does the rest. It has a rejuvenating effect on the tissues and organs, stimulates metabolism, increases the general vitality, and enhances the power of resistance to disease.

The radio-activity of the natural springs exists only at the source, because radium emanation has the peculiar property of disintegrating and vanishing within a few days. That is why it cannot be bottled and exported.

It evaporates so quickly that it has to be kept continually recharged, just as the water of the radio-active spring is, by passing through the radium-bearing ore in the earth. But it is possible by artificial means to make ordinary water radio-active up to any strength desired by the physician. It demands a very high dosage. Many of the natural springs are very weak in comparison. I have repeatedly given such water of the strength of 5000 Mache units, and even 10,000, without the least ill effect; but it should not be taken without the supervision of a physician.

It occurred to me in the year 1910 that electric treatment, combined with radium emanation treatment, should improve the functions of the body whenever below the normal; but especially when they are on the decline as in old age. Consequently I started a laboratory (together with a qualified chemist) for a closer study of radium emanation treatment; made numerous investigations into the electric conductivity and action of this gas, and visited the chief European centres where radium is found and the continental spas most famous for the radio-activity of their waters.

It is surprising how little is known of the

action of radium emanation, even to this day. The only place in England where reliable information can be obtained is the Radium Institute in London, which gives facilities for doctors who wish to study its effects, and supplies them with the materials for its application. But the Radium Institute is primarily a research institute, and concerned chiefly with studying the effects of the application of radium to cancer and other—what may be called "surgical" —diseases, with which this book does not deal. We are concerned only with its tonic powers in the various forms of debility.

Radium emanation is absolutely harmless when properly applied, and must not be confused with radium itself, and the powerful *X*-rays. It can be used both internally—by inhalation (usually together with oxygen), and by drinking radio-active water—and for certain external applications, by means of baths, compresses, ionisation, etc.

It is not only the diseases which are due to deficient metabolism which can be successfully treated; but what is more to our purpose is that radium emanation undoubtedly relieves the asthenic conditions of senility, and can be used so as to have a specific effect on the genital glands.

With proper treatment the signs of premature age disappear. The movements of the patient get firm and confident; there is greater elasticity and freedom from fatigue. Of course, if the patient is a brain-worker, sitting all day at his desk, never using his muscles, he cannot expect this effect. Only the brain will feel the benefit. But, in all, metabolism is more vigorous, vital activity is increased, and there is amelioration of the appetite and nutrition, and improvement of respiratory interchanges. There is a revival of the mental powers and a return of the joy of life. The sexual function again asserts itself, but the state of the sex glands is only a sort of barometer of the general health and vigour. It is no more than one harmonious element in a general process of restitution, and gives a pleasurable conviction to the patient that after all he is not so very old.

Similar observations come from various quarters; above all, from Professor Carl von Noorden, and from doctors at Joachimsthal and Kreuznach. Professor Noorden said, "It is definitely established that radio-active substances exert an essentially tonic influence on the generative glands. It is through this

effect that an immense increase in nerve strength and vitality is brought about." As another writer puts it, "It seems to stir up the fires of life throughout the system."

Engelmann (*Lancet*, 1913) referred to Professor Noorden's observations and to the results of O. Hertwig's and Halben's experiments on animals, which confirm them. Professor Sommer, in a monograph on radium and radio-activity, reported on the increase of sexual vigour which takes place. Waldes and Gottlieb observed the same. The rejuvenating effects upon the sex glands, in persons taking the baths at Joachimsthal and Gastein, are well known. Steinach, himself, recommended them for that purpose. It is also well-known that some of the continental spas, possessing radio-active mud baths, have an old-established reputation of curing sterile women.

I, personally, have seen, in the course of my medical practice, a large number of both young and old men, who were sexually incompetent, recover completely after radium emanation treatment; and I have also observed its effect on frigid and sterile women (who have been previously examined by gynæcologists and found free from any abnormality), who subse-

quently conceived and were able to present an heir to their husbands. Realising that these results might be questioned at some future time, I have cut out the respective marriage and birth announcements from the columns of *The Times* newspaper, and inserted them to each name in my case-books. It is interesting to note that all those infants, about whose birth I could obtain information, were of the male sex.

As to the effect of radium emanation on senility, Dr. Saubermann of Berlin, who made an exhaustive study of it, said : " The treatment of the degenerations of old age by radio-active water has been in vogue from very ancient times, though unconsciously employed. I have already mentioned that certain springs on the Continent have long been valued as ' wells of rejuvenation,' and that these springs contain no appreciable quantity of any mineral salt, but do exhibit a considerable amount of radio-activity. On this observation really rests the whole of modern radio-therapy. The brilliant effect obtained at these spas was sought—not incorrectly—in their emanation contents, and was proved to be due to this when it was found that water rendered artificially

radio-active produced the same physiological actions."

The author has produced the most striking effects on the endocrine glands with radio-active compresses, placed on the surface of the body, and reinforced by galvanic currents, applying an indifferent electrode to the spine; and by diathermy, through heating the internal organs. The effect of both methods is an increased circulation, which brings the blood, containing the necessary elements, including hormones, to the tissues. This enables the body to make its own selection, instead of our prescribing a set quantity of the glandular extracts; and it is a safer method than the surgical procedure. Steinach himself recommended diathermy of the entire organism as a means of rejuvenation when vaso-ligature cannot be applied to men, or is refused; and Dr. Peter Schmidt ("The Conquest of Old Age," 1931) admits that "In practice this method has been found of great value in the treatment of senility," and useful, also, in alleviating the symptoms of "change of life" in women, particularly that artificially produced. The former Professor of Physiology in the University of London, W. D. Halliburton, has also acknow-

ledged that "With electricity and radiology we have the power of controlling and influencing the endocrine organs to form more or less of these internal secretions for the benefit of our patients." Radium emanation is one of Nature's products, and radium emanation treatment—as may be seen from the description we have given—may be aptly called, the same as electricity, "one of Nature's remedies."

From time to time there has been a commercial boom in radio-active water and other radium preparations; but all these articles are in advance of the progress of research.

That there is, at present, so little knowledge respecting physiological and therapeutical effects of radium emanation—and the best method to transmit it to the human body—is, in some measure, due to the comparatively short time that has elapsed since its discovery and research into its properties. Also because, like all other research, it was put aside during the years of the Great War; and partly, also, to the small number of observers who have devoted themselves to the study of these phenomena.

CHAPTER IX

GENERAL RULES FOR THE PRESERVATION OF HEALTH IN OLD AGE

We picture old age as something disagreeable because of the infirmities we associate with it. Advanced age cannot be regarded as a blessing when it is accompanied by decay of mind and body. No one who has had opportunities of studying old people can shut his eyes to the fact that many of the incapabilities of old age may be prevented by attention to a few simple rules, the observance of which will not only prolong life, and make it happier and more comfortable, but will reduce to a minimum the period of decrepitude.

There is truth in the poet's lines, in which he tells us :

> " We hurry to the river we must cross,
> And swifter downwards every footstep wends ;
> Happy who reach it ere they count the loss
> Of half their faculties and half their friends."

The great thing is to recognise, in due

time, the restrictions of one's powers and to adapt one's mode of life to them; gradually and increasingly, if possible, rather than by any sudden giving up of major interests and activities. As Professor McDougall said: "We need to cultivate, more and more, the interests of the spectator rather than of the actor."

Old age, without its infirmities, is reached imperceptibly, and is a gradual process which, with proper adaptation, brings joys of its own, especially to the cultured. As Longfellow, writing on the compensations of age, pointed out in the following lines:

> "For age hath opportunity no less
> Than youth itself, though in another dress;
> And as the evening twilight fades away
> The sky is filled with stars invisible by day."

As natural death approaches, physical and mental activity is retarded, and the passing away is without any of those signs which make death so sad, and sometimes terrible, to the onlooker. Indeed, the longer we live, the gentler will be the death. Moderation in all things, so as to keep a reserve of energy, with which to withstand possible disease and minimise the effects of possible accidents, should be the rule.

In order to prolong life and, at the same time, to enjoy it, occupation of some kind is absolutely necessary. It is a great mistake to suppose that idleness is conducive to longevity. It is at all times better to wear out than to rust out; and the latter process is apt to be speedily accomplished. Everyone must have met with individuals who, while fully occupied until sixty, or even seventy years of age, remained hale and strong, but aged with marvellous rapidity after relinquishing work; a change in their mental condition becoming especially prominent. They were men who had been entirely absorbed in their business or profession, allowing themselves no time for hobbies, outside interests, care for other objects and people; and who had hoped, on retirement, to lead a happy existence, pottering about their house and garden. A brain, however, that has been so active cannot summarily be reduced to a standstill. Having no outlet for its energy, it creates undesired and sometimes undesirable thoughts and feelings, which are apt to unbalance the mind and wreck the nervous system.

Even if a highly developed brain is not consciously exercised, its activity does not

necessarily cease; but its energy, having no proper outlet, is likely to be turned inward and lead to self-observation, introspection, irritability, hypochondriasis, or some other derangement. A lack of an intellectual interest leaves the mind open to become the prey of any thoughts that may enter; or else turns it upon itself. If it were kept in a healthy activity, and its interests constantly engaged, a great deal of mischief would be avoided. The poet Cowper has well said:

> "Absence of occupation is not rest,
> A mind quite vacant is a mind distressed."

And Johnson, too, has given sound advice:

> "When you are idle, be not solitary;
> And when you are solitary, be not idle."

A man who has retired from his occupation need no longer think of himself, but should get outside himself by taking an interest in others. He can study the welfare of his family, or help some society or organisation, or assist in communal affairs. This will prevent his getting self-centred—a common failing of old men. He can spend his declining years pleasantly and maintain some of the vigour of manhood by engaging in some work

that shall keep his mind interested; the kind of occupation must depend on his abilities and inclinations. The constitution, the idiosyncrasies, the temperaments, the tastes, and the conditions of life differ so much, that what might do for one man would be quite unsuitable for another. If the work is useful to others or to oneself, that is enough to constitute it satisfactory.

Life is only worth living so long as there is something to live for. We may outlive our occupation, but we can never outlive our usefulness. Those who have exercised their minds suffer less from the years than those who have exercised only their bodies. People with intellectual interests can go outside themselves. They can be concerned with things that do not affect their own beings, but that are of importance to the world at large. As their interest is impersonal and motiveless, it is independent of bodily circumstances. As it is perennial, it is independent of time. It may be only a part of life, but it is a part that can be kept.

Even if the mind has not been specially cultivated, or received any decided bent, there is, at the present day, no lack of subjects on which it can be agreeably and profit-

ably exercised. The particular interest or hobby ought to be commenced while people are still active at work, since the inclination and the aptitude to begin something new disappears, not rarely, long before sixty or sixty-five, the average age when a man retires from his work. A great point is to keep up a variety of mental occupations and to keep awake the interest in many things so as to prevent mental torpor.

Another safeguard is the schooling of the mind in the enjoyment of simple pleasures; in the things that are common to all; the beautiful in nature and art, and in human nature. Young people may, and do, enjoy the gaieties of life; but, as we get older, we realise that happiness, at least lasting happiness, is not achieved by animal pleasures, but by pleasures intellectual; and fortunate are those who have cultivated them in their youth.

Whatever be the sphere of mental activity, no kind of strain must be put upon the mind by a person in advanced age. The brain structure itself may still be sound, and apparently capable of increased exertion; but the heart may no longer bear the strain, or the arteries give way and cause sudden hæmorrhage, resulting in apoplexy, a very common

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end of elderly men. Therefore, when a man finds that a great effort is required to accomplish any mental task that was once easy, he should desist from the attempt, and regulate his work according to his power. With this limitation, it may be taken for granted that the mental faculties will be far better preserved by their exercise than by their disuse.

As a rule, intellectual work can be kept up and, even in excess, can do no harm, so long as unaccompanied by such emotional stress as is caused, for instance, by anxiety. Men who break down from overwork of an intellectual kind are generally men, whether young or old, who have the care for to-morrow; or who are prompted by excessive ambition; or so sensitive that they take failure, or mere inattention, too much to heart. Old men who have preserved their intellectual capacities have a distinct place as counsellors. They should excel in strength of reason, cool judgment, and breadth of view. The conservative tendencies of this period are valuable as checks to the exuberant impulses of youth.

Old age can be made the happiest period of life. One secret of its attainment is contentment. A quiet, calm, contented old age

is beautiful both to him that has and to others that see it. A life that has been fruitful in labour, and ennobled by good actions, has not been spent in vain. There should be no regrets for opportunities gone by; no jealous envy or carping criticism of the younger generation; but kindly interest in their success, and readiness to admit that new methods and new ideas may be needed. We all get discontented and unhappy thoughts at times; but we need not dwell on them. The old man who is discontented with others is generally one who is discontented with himself.

For long life we need a bodily constitution that readily shakes off disease and to be possessed of a mind equally capable of shaking off anxiety. Equanimity of mind is an important element towards longevity.

There is no mental strain so risky as that of a fit of anger, and yet it is precisely in such cases of high blood-pressure that the temper is apt to become very irritable, and angry outbursts may occur on very slight provocation.

Diet

The kind of food preferred depends on personal idiosyncrasy. All articles of food in

common use are wholesome and nutritious; but all men cannot equally digest and assimilate all articles of food. There are things that do not agree with them, though the books tell them that these things contain all the chemical constituents of wholesome and nutritious food.

Hippocrates, nearly 2500 years ago, said: "Such food as is most grateful to the patient, though not so wholesome, is to be preferred to that which is better though distasteful." And another great physician said: "More importance is to be attached to the desires and feelings of the patient than to the doubtful and fallacious rules of medical art." If the patient likes it, and it does him no harm, then he may safely take it. But one thing must be remembered, that as age advances the diet should be regulated largely to the avoidance of accumulation of uric acid. Fresh fruit and green vegetables should form part of the chief meal.

Of course, when there is any digestive disorder, a special diet will have to be prescribed by the physician; but we are dealing here with healthy old men. One rule is important: never to eat what one does not relish, nor force oneself to eat when one has no appetite.

It would be wise, too, to keep the food range as wide as possible, and avoid, as long as one can, limiting and monotonising one's diet. The old man should eat sufficiently, but not too much, of whatever he desires.

Both food and liquor should be very much reduced; but there is no need for a person, accustomed to meat, to become a vegetarian; or for one used to a small daily allowance of alcohol to become a total abstainer. Unfortunately, a great many people are ever so much more concerned in finding out what they should leave out of their diet than what they should leave in their dietary. After all, in so far as health is concerned, it is what we eat, and not what we do not eat, that counts the most. Individual peculiarities must be allowed for; the only general rule is that which prescribes moderation. Still, there are on record exceptions to this rule.

Victor Hugo, who lived to the age of eighty-three, did not smoke and was moderate in his use of wine. On the other hand, he was a great eater. Théophile Gautier speaks of seeing his plate piled at the same time with "fabulous mixtures of cutlets, haricots cooked with oil, beef with tomato sauce, ham omelet, café au lait, and Brie cheese, which he de-

voured indiscriminately, very fast and very long." His intellect was vigorous to the end.

The Homeric feasts of Bismarck, in eating and drinking, made him noted. He mixed beer and champagne, and all sorts of indigestible messes, in quantities that would have killed an ordinary man. He was an immoderate man in other ways also, and personally recorded his excesses at the age of seventy-two. Yet he lived to be eighty-four, retaining all the lucidity and strength of his understanding.

Another instance is Goethe, the greatest of German poets, who was a man of powerful physique, and—though he ate and drank and did other things in anything but moderation, and, in fact, was supposed to be doomed to an early death in his youth—he continued eating and drinking almost to the end.

These, of course, are heroic examples, which do not invalidate the maxim that most men dig their graves with their teeth. Lorand has pointed out: "We occasionally witness the peculiar fact that persons who live very moderately and eat very sparingly, and who totally abstain from alcohol, nevertheless become old before their time, while, on the other hand, there are those who, in spite of

having been addicted all their lives to the pleasures of a bounteous table and unstinted quantity of wine or spirits, yet enjoy a green old age."

Men who are disposed to excessive meat-eating, alcohol, or tobacco should see to it that their bowels act freely. Good elimination will cover a multitude of bad habits. Occasional stress, or an occasional lapse of over-indulgence in food or drink, need do no damage to a strong, organically sound body; but it will hurt a weak one. It is dangerous, however, for very old men to attend regularly at banquets, devouring a many-coursed dinner, sitting for hours in a cramped position at a table in a smoky, badly ventilated hall, and perhaps themselves indulging in a big, strong cigar.

Sleep

Sleep is closely connected with the question of diet. Sound, refreshing sleep is of the utmost consequence to the health of the body; and no substitute can be found for it as a restorer of vital energy. Sleeplessness is often a source of great trouble to elderly people, and one which is not easily relieved. Narcotic remedies are generally mischievous.

Their effects may be pleasant; but the habit of depending on them rapidly grows until they become indispensable. When this stage has been reached, the sufferer is in a far worse plight than before. In all cases, the endeavour should be made to discover whether the sleeplessness is due to any removable cause, such as indigestion, cold, bad circulation, want of exercise, and the like.

Whilst a young man should, as a rule, not exceed seven hours of sleep of a night, the old man requires more sleep as age advances. But often long sleep is due merely to habit. There is no need to prepare oneself for the eternal sleep. Better to have a nap of "forty winks" in the afternoon; a practice which enables many aged people to get through the rest of the day in comfort who would otherwise feel tired and weak. If they rest well at night, there can be no objection to the afternoon nap; but, if sleeplessness be complained of, the nap should be discontinued for a time.

Sleepiness is a bad sign; generally indicating a decline of nervous power. Of course, the man who has no longer any interest in life—who is bored even by the simplest pleasures—has nothing to keep him awake;

but, often, sleepiness is a sign of a general decline.

Physical Exercise

The old man must find some exercise suitable to his diminished vigour. The kind of exercise that hits the mark is the kind a man likes for its own sake. The man who plays golf because golf is recommended to him will hardly get the results from it that he would get from something that appeals strongly to him for its own sake.

As a matter of fact, old age needs little exercise; sunshine and good company cheer the old man. He needs restraint more than incentive. We must see that the old man's machinery works with as little friction as possible. It should never be forgotten that the bodily and nervous energy, in advanced life, are easily exhausted; and that the reserve energy, superabundant in youth, is often so slight as to be unable to meet the smallest demand. Discretion is absolutely necessary. The old man who goes in for athletic competitions with younger men runs risks which he may have cause to regret; though the consequences need not, necessarily, be perceptible at the moment.

An old man should discover, by experience,

how much exercise he can take without exhausting his powers, and should be careful never to exceed the limit. Above all things, sudden and rapid exertion should be scrupulously avoided by persons of advanced age. The machine which may go on working for years at a gentle pace often breaks down altogether when its movements are suddenly accelerated. After all, the young do not look to the aged for muscle; they respect them for their mental powers and their experience.

Avoidance of Exposure

Warmth is very important for the aged. Exposure to chills should be scrupulously avoided. Bronchitis is the malady most to be feared, and its attacks are very easily provoked. Many old people suffer, more or less, from cough during the winter months; and this symptom may recur, year after year, and be almost unheeded. At last, perhaps, a few minutes' exposure to a cold wind increases the irritation in the lungs; the cough becomes worse, and the difficulty of breathing increases, until suffocation terminates in death. That does not mean, of course, that the old man is not to get out into the sunlight and open air; in fact, he will do well to reside in

a place on the southern coast where he can get the most warmth and sunshine.

Dr. Abernethy, a century ago, declared that the three prime rules for health are to keep the feet warm, the head cool, and the bowels open.

Conclusion

It is not to be inferred, from the hints given in the preceding pages, that the preservation of health should be the predominant thought in the minds of elderly persons who desire that their lives should be prolonged. To be always guarding against disease, and to live in a state of constant fear and watchfulness, would make existence miserable and hasten the progress of decay. Selfish and undue solicitude with regard to health not only fails to attain its object, but is apt to induce that diseased condition of mind known as hypochondriasis, a condition well known to all practising physicians, the victims of which are always a burden and a nuisance, if not to themselves, at least to all connected with them. Addison, in the *Spectator*, after describing the valetudinarian who constantly weighed himself and his food, and yet became sick and languishing, aptly remarked: "A continual anxiety for life vitiates all the

relishes of it, and casts a gloom over the whole face of nature; as it is impossible that we should take delight in anything that we are at every moment afraid of losing."

If we have been of sound stock, led a temperate life, avoided harmful agencies, indulged as seldom as possible in passions and evil thoughts—in a word, if we have observed the hygiene of body and mind, we may look forward to a pleasant old age without regret. Moderation in all things is necessary in order to keep a reserve of energy with which to withstand possible disease and minimise the effects of possible accidents.

Generally, it will be found that those who reach old age are of an alert temperament, fairly active in body and certainly keen in mind; they have the power of speedy recovery after fatigue; their appetite is good and digestion excellent; they are rarely troubled with illness, and have had little or no occasion to take physic; they are temperate in most things; they neither sleep too little nor too much; they retain a keen pleasure in all that is going on around them; and, usually, they are placid, kindly, energetic, and cheerful. Only a few will be found to have been of intemperate or idle habits.

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